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BRAZILIAN DEEP-SEA MACROCYPRIDIDAE MÜLLER, 1912 (CRUSTACEA, OSTRACODA, MACROCYPRIDOIDEA) [1]

(With 13 figures)

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ABSTRACT: Ten species of macrocypridids, included in five genera, had been previously recorded from Brazilian deep-sea. In this study, six samples with Macrocyprididae Müller, 1912 collected from eastern Brazilian continental slope were studied, and eight species were recorded: *Macropyxis adrecta* Maddocks, 1990; *Macropyxis* cf. *adunca* Maddocks, 1990; *Macropyxis amanda* Maddocks, 1990; *Macropyxis bathyalensis* (Hulings, 1967); *Macropyxis similis* (Brady, 1880); *Macrosarisa* sp.1, *Macroscapha* aff. *inaequata* Maddocks, 1990; *Macroscapha* sp.1. Two species, *Macropyxis adrecta* and *Macropyxis amanda*, are here recorded for the first time from the Western Atlantic. *Macropyxis bathyalensis* is recorded for the first time from the Southern Atlantic. *Macropyxis similis*, previously recorded from the eastern Brazilian continental slope, has its geographic range extended southwards.

A total of nine named species and six unnamed species of Macrocyprididae are now known from the Brazilian deep-sea. The known distribution of these species is rather punctual. Additional sampling over the continental slope and the abyssal plain off Brazil probably will enlarge the number of species recorded from this area and will clarify their general distribution patterns.

Key words: Macrocyprididae, Ostracoda, Crustacea, deep-sea, Brazil.

RESUMO: Macrocyprididae Müller, 1912 (Crustacea, Ostracoda, Macrocypridoidea) em águas profundas ao largo do Brasil.

Dez espécies de macrocipridídeos, incluídos em cinco gêneros, foram previamente registrados para águas profundas ao largo do Brasil. Neste estudo, foram analisadas seis amostras de Macrocyprididae coletadas do talude continental leste brasileiro, sendo registradas oito espécies: *Macropyxis adrecta* Maddocks, 1990; *Macropyxis* cf. *adunca* Maddocks, 1990; *Macropyxis amanda* Maddocks, 1990; *Macropyxis bathyalensis* (Hulings, 1967); *Macropyxis similis* (Brady, 1880); *Macrosarisa* sp.1, *Macroscapha* aff. *inaequata* Maddocks, 1990; *Macroscapha* sp.1. Duas espécies, *Macropyxis adrecta* e *Macropyxis amanda*, são registradas pela primeira vez para o Atlântico Ocidental. *Macropyxis bathyalensis* é registrada pela primeira vez para o Atlântico Sul. *Macropyxis similis*, previamente registrada para o talude continental leste brasileiro, tem sua distribuição geográfica estendida para o sul.

Depois deste estudo, um total de nove espécies nomeadas e seis espécies não nomeadas de Macrocyprididae estão registradas para águas profundas ao largo do Brasil. A distribuição dessas espécies é pontual. Novas amostragens sobre o talude continental e a planície abissal ao largo do Brasil provavelmente aumentarão o número de espécies registradas para essas regiões e elucidará os padrões gerais de distribuição.

Palavras-chave: Macrocyprididae, Ostracoda, Crustacea, mar profundo, Brasil.

INTRODUCTION

The family Macrocyprididae includes approximately 140 species in eight genera: *Macrocypris* Brady, 1868; *Macrocyprina* Triebel, 1960; *Macropyxis* Maddocks, 1990; *Macrosarisa* Maddocks, 1990; *Macroscapha* Maddocks, 1990; *Macrocypria* Sars, 1923; *Macrocyprissa* Triebel, 1960; and *Macromckenziea* Maddocks, 1990. The first five genera have been recorded from Brazil.

Three named species of *Macrocyprina* Triebel, 1960 and two unnamed species were previously recorded from Brazilian waters (DIAS-BRITO, MOURA & WÜRDIG, 1988; COIMBRA, RAMOS & SANGUINETTI, 1992; COIMBRA *et al.*, 1999; BRANDÃO, in press). All of these species were recorded from the continental shelf, and one of them, *Macrocyprina* sp.1 was also recorded from the shallow continental slope, deepest record of 223m (Figs.1, 13, Tab.1) (COIMBRA, RAMOS & SANGUINETTI, 1992; COIMBRA, 1995; COIMBRA *et al.*, 1999).

The records of the other four genera known from Brazil exclusively comprise specimens collected from the deep-sea (Figs.1-3, 13, Tab.1). These records are

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included in only two studies. BRADY (1880) analysed the Ostracoda collected by the "H.M.S.Challenger", in which two samples originated from the eastern Brazilian continental slope (stations 120 and 122). From these two samples, he described two species, *Macrocypris similis* and *Macrocypris tenuicauda*, and recorded *Macrocypris decora* (Brady, 1866).

More than one century later, MADDOCKS (1990) described *Macrocypris maioris* from the abyssal plan of Brazil Basin; and *Macrosarisa bensoni*, which included the Brazilian specimens cited by BRADY (1880) as *Macrocypris tenuicauda*. MADDOCKS (1990) also transferred *Macrocypris tenuicauda* to *Macropyxis*. Furthermore, MADDOCKS (1990) recorded on other four species of *Macropyxis* from off Brazil: *Macropyxis kornickeri* Maddocks, 1990, from the eastern continental slope, and *Macropyxis adunca* Maddocks, 1990, from the southern Brazil Basin (abyssal plan); and two unnamed species, *Macropyxis* sp.11 and sp.18, from the eastern continental slope and from northern Brazil Basin (abyssal plan), respectively. MADDOCKS (1990) also transferred *Macrocypris similis* to *Macropyxis*, and considered *Macrocypris decora* as a *nomen dubium*. Finally, one unnamed species of *Macrosarisa* (as *Macrosarisa* sp.23) was recorded from the northern Brazil Basin (abyssal plan); and one unnamed species of *Macroscapha* (as *Macroscapha* sp.30) was recorded from the eastern Brazilian continental slope.

Therefore, ten species in five genera, were recorded from the deep-sea off Brazil.

In the present study, the macrocypridid specimens collected from the continental slope off Brazil are identified and figured. The information concerning species previously recorded from Brazilian deep-sea is summarised. The geographic distribution of the deep-sea species of Macrocyprididae occurring off Brazil is illustrated.

MATERIAL AND METHODS

The six samples analysed were collected from the eastern Brazilian continental slope (off Espírito Santo, Rio de Janeiro and São Paulo states), between 21°12'13"S and 24°06'43"S, 39°08'00"W and 41° 52'52"W, 1092 and 2426m depth. The depths listed in the items Material examined and Distribution of each species, are the beginning and end points of dredgings rather than the ecological depth ranges. This also happens with some of the bathymetric ranges transcribed from MADDOCKS (1990:5).

The samples collected were fixed in formalin 4% and the specimens were transferred to ethanol 70% after sorting. The specimens were illustrated with the aid of a camera lucida couplet to a Zeiss microscope. Identifications of the specimens are based on the original descriptions and illustrations of the species (BRADY, 1880; HULINGS, 1967a; MADDOCKS, 1990).

Abbreviations used in this study: (h) height, (l) length, (LV) left valve(s), (RV) right valve(s), (RLV) closed right and left valves; (MNRJ) Museu Nacional - Rio de Janeiro.

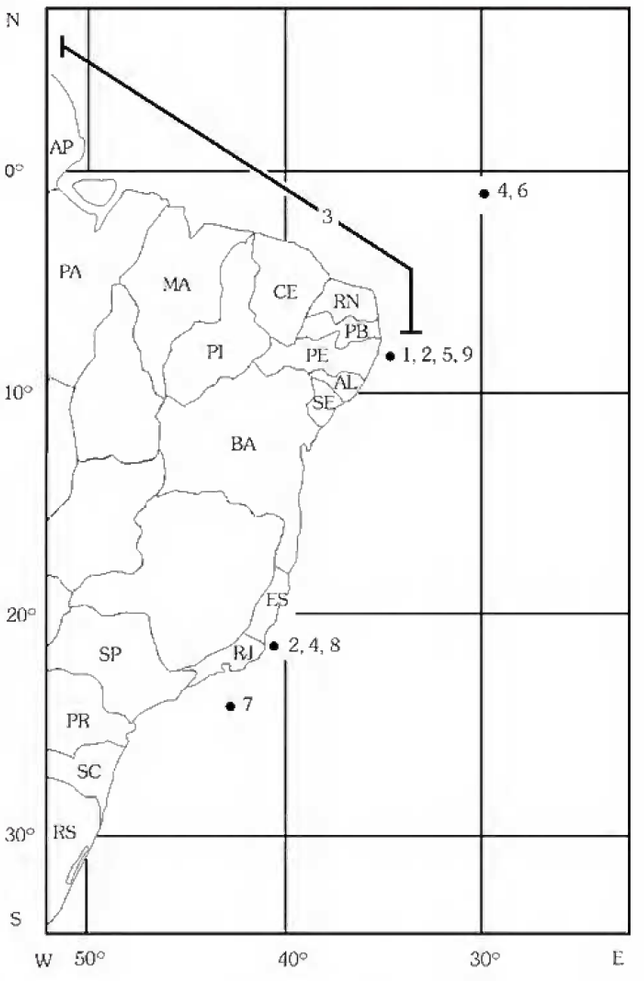
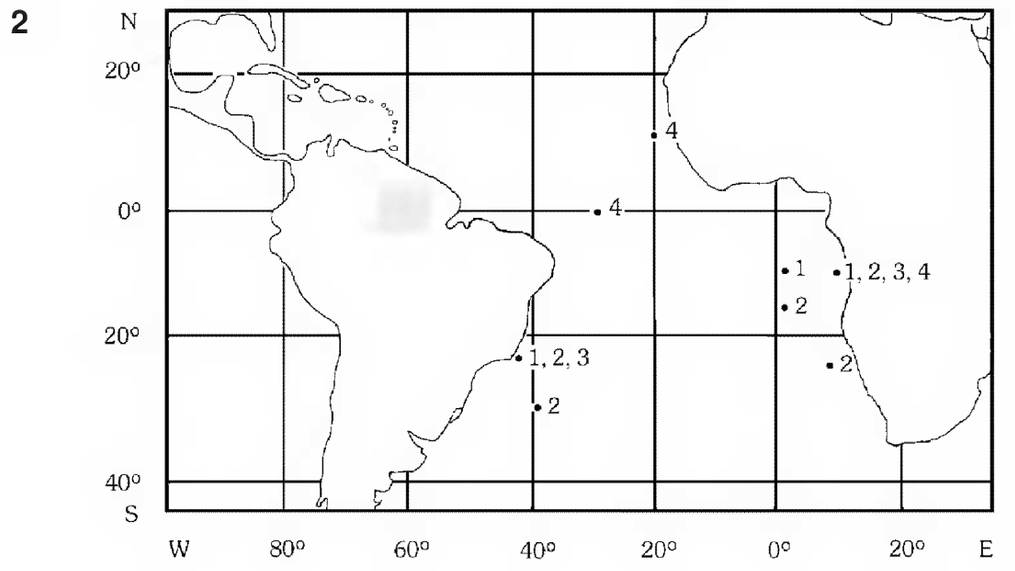
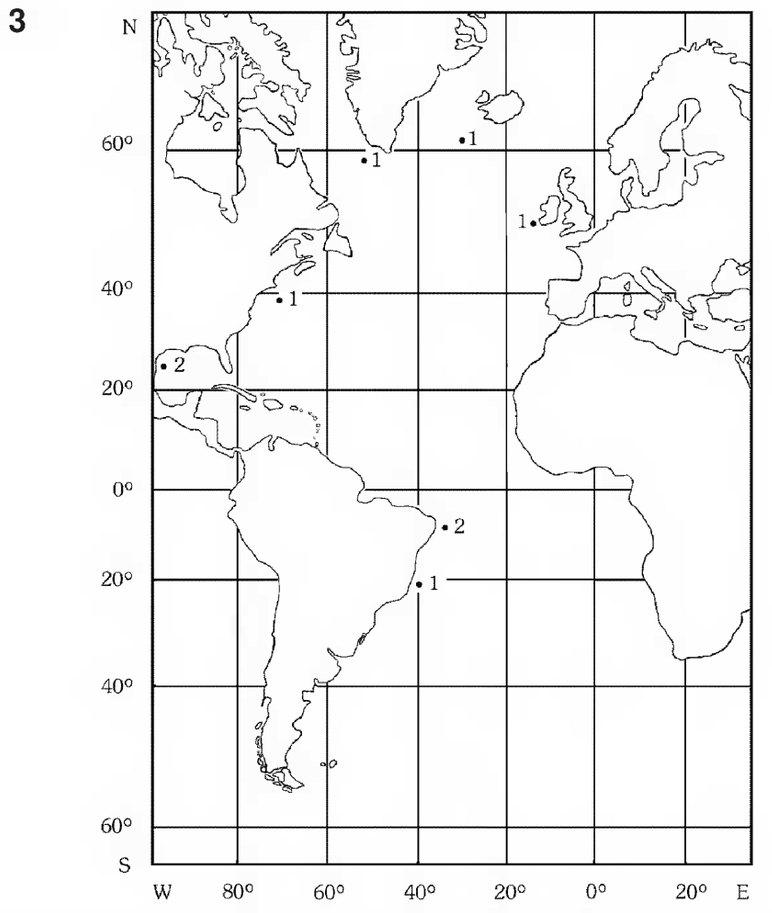


Fig.1- Geographic distribution of Macrocyprididae species reported exclusively off Brazil: (1) *Macropyxis kornickeri*, (2) *Macropyxis similis*, (3) *Macrocyprina* sp.1 of COIMBRA (1995) and COIMBRA *et al.* (1999), (4) *Macrosarisa* sp.1, (5) *Macropyxis* sp.1 of MADDOCKS (1990), (6) *Macropyxis* sp.2 of MADDOCKS (1990), (7) *Macroscapha* aff. *inaequata*, (8) *Macroscapha* sp.1, (9) *Macroscapha* sp.2. (AL) Alagoas, (AP) Amapá, (BA) Bahia, (CE) Ceará, (ES), Espírito Santo, (MA) Maranhão, (PA) Pará, (PB) Paraíba, (PE) Pernambuco, (PI) Piauí, (PR) Paraná, (SC) Santa Catarina, (SE) Sergipe, (SP) São Paulo, (RJ) Rio de Janeiro, (RN) Rio Grande do Norte, (RS) Rio Grande do Sul.





Geographic distribution of Brazilian macrocypridid species – fig.2- reported exclusively to the South Atlantic: (1) *Macropyxis adrecta*, (2) *Macropyxis aduncа*, (3) *Macropyxis amanda*, (4) *Macrocypris maioris*; fig.3- reported from the North and South Atlantic: (1) *Macropyxis bathyalensis*, (2) *Macrosarisa bensoni*.

Table 1. Records of the Macrocyprididae species reported from the deep-sea off Brazil.

SPECIES / OCCURRENCE	OFF BRAZIL	OTHER LOCALITIES
Macrocyprina sp.1	Eastern continental shelf - Tamandaré Bay, Pernambuco, 8°44' to 8°47'30"S, 35°05' to 35°07'W (COIMBRA, RAMOS & SANGUINETTI, 1992). Northern continental shelf and continental slope - 5°N to 6°S; 35°W to 51°W, 15 to 223m (COIMBRA, 1995; COIMBRA *et al.*, 1999).	
Macrocypris maioris	Brazil Basin - 0°46.0'S to 0°46.5'S, 29°28.0'W to 29°24.0'W, 3459m (MADDOCKS, 1990).	Sierra Leone Basin - 10°36'N, 17°49'W, 2185m. Angola Basin - 10°24'S, 9°09'E, 4559 to 4566m; 10°29'S, 9°04'E, 4597 to 4595m; 10°29'S, 9°03'E, 4612 to 4630m (MADDOCKS, 1990).
Macropyxis adrecta	Eastern continental slope - 21°12'13"S, 39°52'05"W, 1598 to 1600m; 21°53'11.904"S, 39°50'44.863"W, 1240m; 21°53'45.759"S, 39°50'22.530"W, 1300m; 24°06'43"S, 41°52'52"W, 1556 to 1566m (new records).	Angola Basin - 10°24'S, 9°09'E, 4559 to 4566m; 10°29'S, 9°04'E, 4595 to 4597m; 12°0.5'S, 1°58.5'E, 5631m (MADDOCKS, 1990).
Macropyxis adunca	Eastern continental slope - 21°12'13"S, 39°52'05"W, 1598 to 1600m; 24°06'43"S, 41°52'52"W, 1556 to 1566m (new records). Brazil Basin - 30°24.4'S, 39°00'W, 4818m (MADDOCKS, 1990).	Angola Basin - 10°24'S, 9°09'E, 4559 to 4566m; 15°59.9'S, 1°58.5'E, 5550m; 24°0.2'S, 8°28.5'E, 4637m (MADDOCKS, 1990).
Macropyxis amanda	Eastern continental slope - 21°12'13"S, 39°52'05"W, 1598 to 1600m; 21°48'22"S, 39°49'55"W; 1092 to 1438m; 21°53'11.904"S, 39°50'44.863"W, 1240m; 21°53'45.759"S, 39°50'22.530"W, 1300m (new records).	Angola Basin - 9°41'S to 9°43.5'S, 10°55'E to 10°57'E, 2644 to 2754m (MADDOCKS, 1990).
Macropyxis bathyalensis	Eastern continental slope - 21°14'31"S, 39°08'00"W; 2302 to 2426m; 24°06'43"S, 41°52'52"W, 1556 to 1566m (new records).	European Basin - 49°38'00"N, 13°28'00"W, 1955m (TRESSLER, 1941; MADDOCKS, 1990); 49°37'00"N, 13°34'00"W, 3230m (TRESSLER, 1941). Labrador Basin - 61°44'N, 30°29'W, 2137m; 59°12'N, 51°05'W, 3521m; 57°50'N, 54°06'W, 3369m (HULINGS, 1967a; HULINGS, 1967b; MADDOCKS, 1990). North American Basin - 38°46.8'N, 70°6.8'W, 2891m; 37°59.2'N, 69°26.2'W, 3834m; 32°19.4'N to 32°19.0'N, 64°34.9'W to 64°34.8', 1135 to 1153m (MADDOCKS, 1990). Continental slope off southeastern USA - 35°N to 27°N, 79°W to 75°W, 201 to 585m (HULINGS, 1967a).

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SPECIES / OCCURRENCE	OFF BRAZIL	OTHER LOCALITIES
Macropyxis kornickeri	Eastern continental slope - 7°50.0'S to 7°58.0'S, 34°17.0'W, 943 to 1007m; 8°2'S to 8°3'S, 34°23'W to 34°25'W, 587m (MADDOCKS, 1990).	
Macropyxis similis	Eastern continental slope - 7°50.0'S to 7°58.0'S, 34°17.0'W, 943 to 1007m; 8°2'S to 8°3'S, 34°23'W to 34°25'W, 587m; 8°37'S, 34°28'W, 1235m; 21°12'13"S, 39°52'05"W, 1598 to 1600m; 21°48'22"S, 39°49'55"W; 1092 to 1438m; 21°53'11.904"S, 39°50'44.863"W, 1240m; 21°53'45.759"S, 39°50'22.530"W, 1300m (BRADY, 1880; MADDOCKS, 1990; new records).	
Macropyxis sp.1	Eastern continental slope - 7°58'S, 34°22'W, 834 to 939m (MADDOCKS, 1990).	
Macropyxis sp.2	Brazil Basin - 0°46.0'S to 0°46.5'S, 29°28.0'W to 29°28.0', 3459m (MADDOCKS, 1990).	
Macrosarisa bensoni	Eastern continental slope - 7°58'S, 34°22'W, 834 to 939m; 9°5'S, 34°49'W, 640m (BRADY, 1880; MADDOCKS, 1990).	Continental slope off southeastern USA - 27°20.9'N 95°9.0W, 1079m (MADDOCKS, 1990).
Macrosarisa sp.1	Brazil Basin - 0°3.0'S, 27°48.0'W, 3730 to 3783m (MADDOCKS, 1990). Eastern continental slope - 21°14'31"S, 39°08'00"W; 2302-2426m (new record).	
Macroscapha aff. *inaequata*	Eastern continental slope - 21°53'11.904"S, 39°50'44.863"W, 1240m; 24°06'43"S, 41°52'52"W, 1556 to 1566m (new records).	
Macroscapha sp.1	Eastern continental slope - 21°53'45.759"S, 39°50'22.530"W, 1300m (new records).	
Macroscapha sp.2	Eastern continental slope - 7°50.0'S to 7°58.0'S, 34°17.0'W, 943 to 1007m; 7°58'S, 34°22'W, 834 to 939m; 8°2'S to 8°3'S, 34°23'W to 34°25'W, 587m (MADDOCKS, 1990).	

TAXONOMY

Genus *Macropyxis* Maddocks, 1990

Type species – *Macrocypyxis sapeloensis* (Darby, 1965).

Additional species – *Macrocypyxis adrecta* Maddocks, 1990; *M. adriatica* (Breman, 1975); *M. adunca* Maddocks, 1990; *M. amanda* Maddocks, 1990; *M. amoena* Maddocks, 1990; *M. antonbruunae* Maddocks, 1990; *M. arta* Maddocks, 1990; *M. audens* Maddocks, 1990; *M. bathyalensis* (Hulings, 1967); *M. eltaninae* Maddocks, 1990; *M. improcera* Maddocks, 1990; *M. kaesleri* Maddocks, 1990; *M. kalbi* Maddocks, 1990; *M. kornickeri* Maddocks, 1990; *M. labutisi* Maddocks, 1990; *M.*

longana (van den Bold, 1960); *M. rhodana* (van den Bold, 1960); *M. similis* (Brady, 1880); *M. simulans* Maddocks, 1990; *M. steinecki* Maddocks, 1990; *M. tenuicauda* (Brady, 1880).

Remarks – The genus *Macropyxis*, with 22 described species, has a worldwide distribution, with a live depth range from 49 to 6134m, but recorded dead down to 9m. It has a geologic range from the Eocene to the Present. *Macropyxis* and *Macrocyprina* are the most diverse genera of Macrocyprididae. *Macropyxis* is the characteristic representant of the Macrocyprididae in psychrospheric fauna, presenting numerous bathyal and abyssal species in all oceans. The length of the adult carapace of species varies from 0.8mm in *Macropyxis improcera* to 3.0mm in *Macropyxis kalbi*.

The species of *Macropyxis* previously recorded from Brazilian waters are *Macropyxis aduncа*, *Macropyxis kornickeri* and *Macropyxis similis* (BRADY, 1880; MADDOCKS, 1990).

Macropyxis adrecta Maddocks, 1990
(Figs.4-5)

Macropyxis adrecta Maddocks, 1990:59, figs.8(13-14), 9(13-14), 19(5), 22(8), 24(7), 26(24-25), 30(6), 34(6), 39(3), 46(62-63), 50(20-21), 51(31-32), 56(3, 21), 58(13), 59(20), 61(8), 63(2), 64(8), 67(9), 80(12), pls. 14(3-6), 15(4-6), 63(1,2), 66(1,2), 78(27-28), 88(1), 102(10, 13), graph 14.

Type-locality – 10°24'S, 9°09'E, 4559 to 4566m, Atlantis II, cruise 42, station 198.

Material examined – Eastern Brazilian continental slope. Off Espírito Santo State: 21°12'13"S, 39°52'05"W, 1598-1600m, 1♀ RV, 2♂ RV, MNRJ 18631. Off Rio de Janeiro State: 21°53'11.904"S, 39°50'44.863"W, 1240m, 4♀ RV, MNRJ 18633; 21°53'45.759"S, 9°50'22.530"W, 1300m 1♀ RLV, 4♀ RV, 3♀ LV, 1♂ RV MNRJ 18634. Off São Paulo State: 24°06'43"S, 41°52'52"W, 1556-1566m, 21♀ RLV, 131♀ RV, 39♀ LV, 3♂ RLV, 11♂ RV, 12♂ LV, MNRJ 18632.

Dimensions – MNRJ 18632: ♀ - RV, h: 0.53mm, l: 1.22mm. ♀ - RV, h: 0.53mm, l: 1.20mm. ♀ - RV, h: 0.55mm, l: 1.21mm. ♀ - LV, h: 0.45mm, l: 1.19mm. ♀ - LV, h: 0.46mm, l: 1.19mm. ♀ - LV, h: 0.46mm, l: 1.18mm. ♂ - RV, h: 0.48mm, l: 1.25mm. ♂ - RV, h: 0.48mm, l: 1.24mm. ♂ - RV, h: 0.49mm, l: 1.28mm. ♂ - LV, h: 0.43mm, l: 1.21mm. ♂ - LV, h: 0.40mm, l: 1.24mm. ♂ - LV, h: 0.43mm, l: 1.26mm. ♂ - LV, h: 0.43mm, l: 1.24mm.

Diagnosis – Female right valve subtrapezoidal in lateral outline with high-arched dorsal margin and greatest height located near midlength; ventral margin gently sinuate, upswung near posterior margin; posterodorsal margin steeply sloping. Male right valve elongate in lateral outline, dorsal margin low-arched and subparallel to ventral margin; sharp posterior angle of about 65° in female and 45° in male; anterior zone of concrescence broad to very broad, with elaborately branching radial pore canals (modified from MADDOCKS, 1990). In the present study only carapaces were available. See MADDOCKS (1990:60) for the appendages.

Supplementary description – Carapace small, with strong sexual dimorphism (Figs.4A-D). Female distinctively higher, and fairly shorter in length than male. Female right valve (Fig.4A) subtrapezoidal in lateral outline with high-arched dorsal margin, greatest height near midlength; anterior margin broadly rounded; female left valve (Fig.4B) with dorsal margin divided in three fairly straight segments, greatest height anterior to midlength. Male valves (Figs.4C, D) elongate in lateral outline. Right valve (Fig.4C) with low-arched dorsal margin, with anterior part subparallel to ventral margin, and posterior part steeply sloping; anterior margin broadly rounded; greatest height near midlength. Male left valve (Fig.4D) with dorsal margin divided in three fairly straight segments, anterodorsal angle more conspicuous than posterodorsal angle; greatest height anterior to midlength. Male and female right valves with ventral margin almost straight, slightly upswung near posterior. Male and female left valves with ventral margin slightly indented and slightly upswung near posterior. Posterodorsal margin of male and female right and left valves steeply sloping, straight; sharp posterior angle of about 65° in female and 45° in male. Anterior zone of concrescence broad to very broad, vestibule fairly constricted, line of concrescence irregular, elaborately branching radial pore canals. Posterior zone of concrescence fairly broad, vestibule deep, line of concrescence fairly straight; posterior radial pore canals straight. Carapace ovate in ventral and dorsal views (Figs.4E, F); with tapering laterals; anterior and posterior ends more acutely tapering. Ventral margin broadly sinuous, in ventral view (Fig.4E), with large bow-shaped process. Hinge margin doubly sinuous in dorsal view (Fig.4F), with conspicuous stragulum. Muscle scar pattern (Figs.5A, B) with three dorsal scars and numerous ventral scars.

Distribution – Holocene; South Atlantic, 1240 to 5631m (Figs.2, 13). Angola Basin, 4559 to 5631m, live and dead specimens (MADDOCKS, 1990). Eastern Brazilian continental slope, 1240 to 1600m, dead specimens (new records).

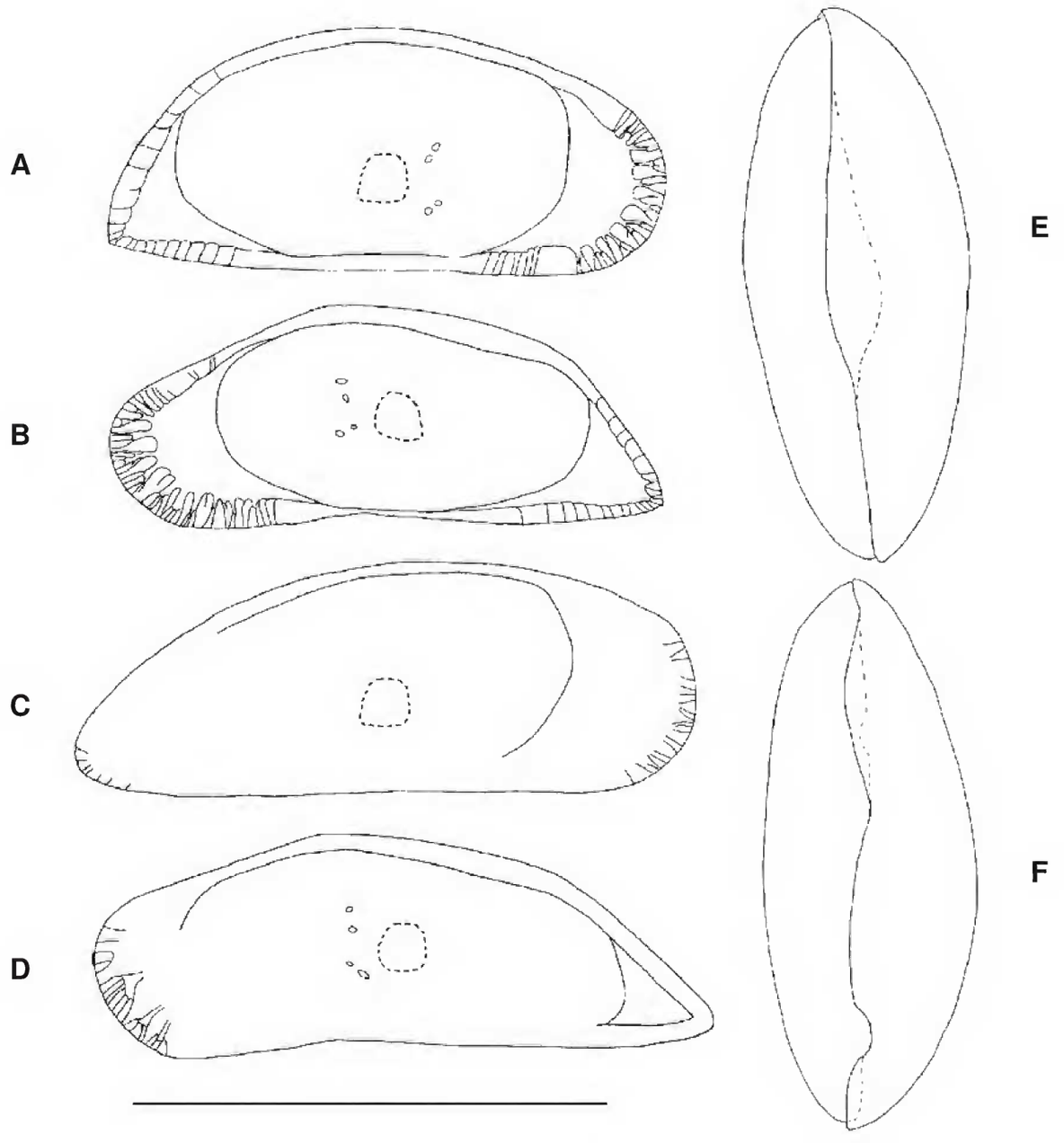

Fig.4- *Macropyxis adrecta* Maddocks, 1990, MNRJ 18632: (A) right valve of female, (B) left valve of female, (C) right valve of male, (D) left valve of male, (E) ventral view of carapace, (F) dorsal view of carapace. Scale bar = 1.0mm.

Remarks – The specimens of *Macropyxis adrecta* recorded by MADDOCKS (1990) are larger (holotype, ♂ - RV, h: 0.76mm, l: 2.17mm; LV, h: 0.71mm, l: 2.08mm) than specimens analysed in the present study (length approximately 1.2mm). The size variation exhibited by *Macropyxis adrecta* (approximately 0.9mm) is the largest in the genus. In other species, the size variation of carapace can range from 0.1 to 0.5mm (MADDOCKS, 1990).

Of the three species previously recorded from Brazil, *Macropyxis adrecta* is similar to *Macropyxis adunca*, while the valves of *Macropyxis kornickeri* and *Macropyxis similis* are lower in relation to length, with more elongated and acute posterior angles than *Macropyxis adrecta*.

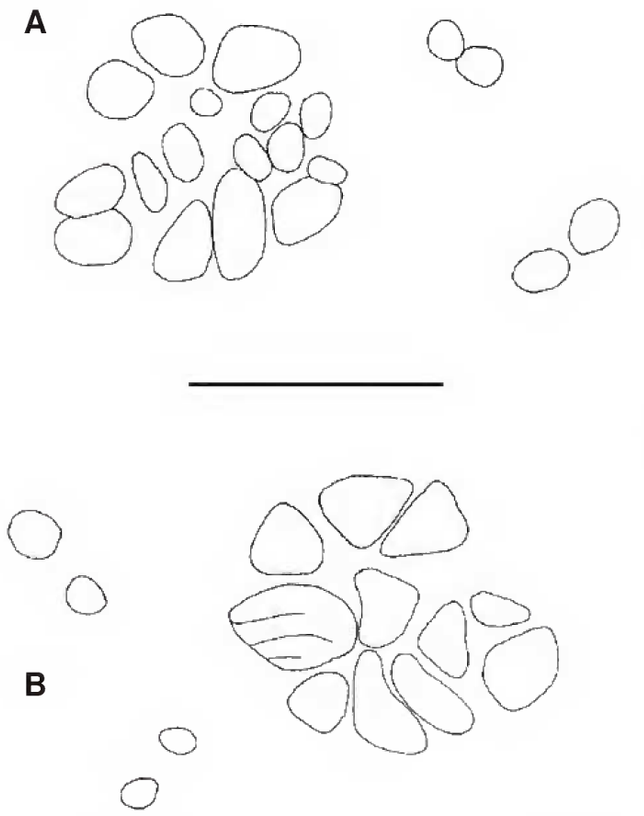

Fig.5- *Macropyxis adrecta* Maddocks, 1990, MNRJ 18632: (A) adductor muscle scars of right valve, (B) adductor muscle scars of left valve. Scale bar = 0.1mm.

Despite the similarity between *Macropyxis adrecta* and *Macropyxis adunca*, some differences in the carapace shape can be observed. The valves of *Macropyxis adrecta* present strong sexual dimorphism, male and female valves being well differentiated. On the other hand, *Macropyxis adunca* presents a feeble sexual dimorphism in carapace morphology, and males and females are only consistently differentiated by the appendages. The valves of females of *Macropyxis adrecta* are easily differentiated from males of the same species, and also from specimens (males and females) of *Macropyxis adunca*, by their more ovate outline. Furthermore, males of *Macropyxis adrecta* present differences when compared to males and females of *Macropyxis adunca*. As MADDOCKS (1990) stated, the carapaces of males of *Macropyxis adrecta* have less sinuous outline; more straight ventral margin; and more broadly rounded anterior margin. Valves of males and females of *Macropyxis adunca* have more sinuous contours; with the mouth region of the ventral margin being more distinctly indented; with posterior angle more upswung; and the anterior margin more narrowly rounded. Otherwise, some specimens analysed in the present study could not readily be assessed to any of the two species, because they present intermediate carapace characters, and no appendages were available for analysis. In spite of that, *Macropyxis adrecta* is recorded from the samples analysed due to the presence of females with their distinctive outlines.

MADDOCKS (1990) also described differences in appendages between *Macropyxis adrecta* and *Macropyxis adunca*. Male fifth appendages and hemipenis of both species present distinct outlines – MADDOCKS, 1990: fig.26 (24-25, 30-31), pl.88 (1, 13-14). *Macropyxis adunca* presents a longer Zenker's Organ with the vas deferens irregularly coiled – MADDOCKS, 1990: pl.100 (10, 13, 15-16) –, while in *Macropyxis adrecta* the vas deferens coils more regularly around it self – MADDOCKS, 1990: pl.102 (10, 13). Finally, *Macropyxis adrecta* displays the seventh limb with a longer reflexed seta – MADDOCKS, 1990: fig.61 (5, 8). Unfortunately, the samples did not present any living specimen for dissection.

Macropyxis adrecta was recorded from the abyssal region of Angola Basin (MADDOCKS, 1990:59-60). In the present study, the distribution of this species is extended to the Western Atlantic.

Macropyxis cf. *adunca* Maddocks, 1990
(Fig.6)

Macrocypris sp.3 – MADDOCKS, 1977, fig.10.
Macropyxis adunca Maddocks, 1990:61, figs.8(2-3), 9(2-3), 19(6), 22(11), 24(18), 26(30-31), 30(3), 33(2), 41(6), 46(58-59), 50(22), 51(33), 57(8), 58(12), 61(5), 64(7), 66(7), 80(10), pls.14(1-2, 7-8), 15(1-3, 7-8), 58(5), 78(29), 88(13-17), 100(10, 13, 15-19), 111(3), graph 16.

Type-locality – Knorr, cruise 25, station 306, 15°59.5'S, 1°38.5'E, 5550m.

Material examined – Eastern Brazilian continental slope. Off Espírito Santo State: 21°12'13"S, 39°52'05"W, 1598-1600m, 1 RV, MNRJ 18635. Off São Paulo State: 24°06'43"S, 41°52'52"W, 1556-1566m, 4 RLV, 11 RV, 8 LV, MNRJ 18747.

Dimensions – MNRJ 18747 - Gender unknown, RV, h: 0.48mm, l: 1.29mm. Gender unknown, RV, h: 0.46mm, l: 1.23mm. Gender unknown, RV, h: 0.48mm, l: 1.26mm. Gender unknown, RV, h: 0.48mm, l: 1.26mm. Gender unknown, LV, h: 0.43mm, l: 1.25mm. Gender unknown, LV, h: 0.41mm, l: 1.24mm. Gender unknown, LV, h: 0.43mm, l: 1.25mm. Gender unknown, LV, h: 0.43mm, l: 1.30mm.

Diagnosis – Carapace elongate-ovate in lateral outline with sinuous contours; dorsal margin

smoothly but gently arched; anterior margin somewhat narrowly rounded; ventral margin sinuous, distinctly indented in mouth region and upswung posteriorly; somewhat flared, truncate, sinuate posterior angle of about 45° to 55°; zone of concrescence broad, line of concrescence deeply scalloped, radial pore canals complexly branching, arranged in large bundles (MADDOCKS, 1990). In the present study, only carapaces were available for analysis. See MADDOCKS (1990:61-62) for description and illustrations of appendages.

Supplementary description – Carapace small (Figs.6A, B), with sexual dimorphism weakly developed, females and males clearly distinguishable by appendages only. Right valve (Fig.6A) elongate in lateral outline with low-arched dorsal margin, greatest height located anterior to midlength; anterior margin somewhat narrowly rounded. Left valve (Fig.6B) with dorsal margin with conspicuous anterodorsal angle; margin segment anterior to this angle fairly straight; margin segment posterior to anterodorsal angle unevenly curved, posterodorsal angle fairly indistinct; greatest height anterior to midlength. Right and left valves with sinuous ventral margin; upswung posterior angle of about 45° to 55°. Anterior and posterior zone of concrescence broad, vestibule constricted to fairly constricted, anterior line of concrescence deeply scalloped, posterior line of concrescence fairly straight; anterior radial pore canals complexly branching, arranged in large bundles, posterior radial pore canals straight. Carapace elongate in ventral and dorsal views (Figs.6E, F); with subparallel laterals; anterior and posterior ends slightly tapering. Ventral margin sinuous, in ventral view (Fig.6E), with large bow-shaped process. Hinge margin sinuous in dorsal view

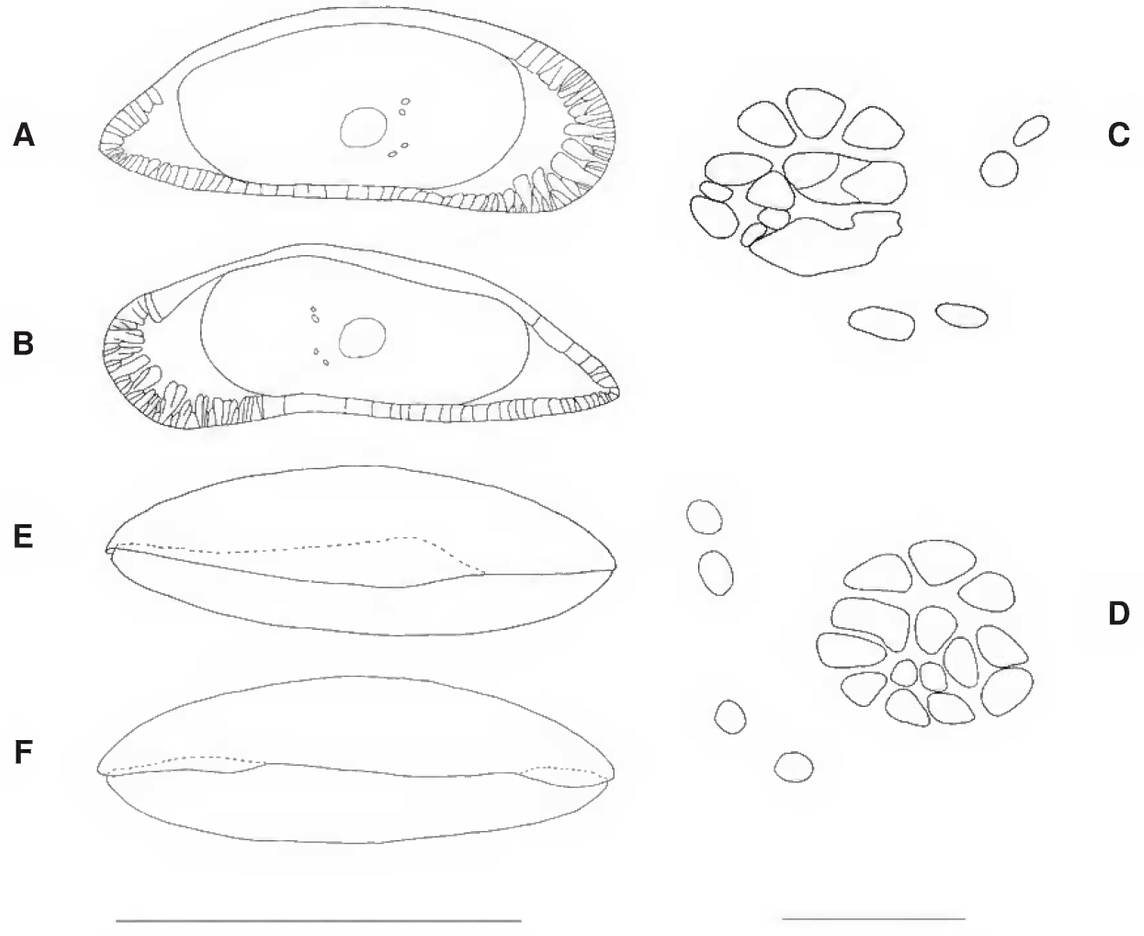

Fig.6- *Macropyxis* cf. *adunca* Maddocks, 1990, MNRJ 18747: (A) right valve, (B) left valve, (C) adductor muscle scars of right valve, (D) adductor muscle scars of left valve, (E) ventral view of carapace, (F) dorsal view of carapace. Scale bars (A, B, E, F) = 1.0mm, (C, D) = 0.1mm.

(Fig.6F), with conspicuous stragulum. Muscle scar pattern (Figs.6C, D) with three dorsal scars and numerous ventral scars.

Distribution – Holocene; South Atlantic, 1556 (?) to 5550m (Figs.2, 13). Angola Basin, 4559 to 5550m, live specimens (MADDOCKS, 1977; 1990). Brazil Basin, 4818m, live specimen (MADDOCKS, 1977; 1990); Eastern Brazilian continental slope (?), 1556 to 1600m, dead specimen (new record).

Remarks – The specimens herein identified as *Macropyxis* cf. *adunca* present a more sinuous outline, and a more upswung posterior angle than the specimens identified as *Macropyxis adrecta*. These differences in outline, and also other differences in the appendages, were used by Maddocks (1990:60) to distinguish the two species. But, as the differences in outline are rather subtle and no appendages were analysed, it is not possible to fully ensure the occurrence of *Macropyxis adunca* in the samples analysed.

Specimens of *Macropyxis* cf. *adunca* analysed in the present study are smaller (length approximately 1.3mm) than the specimens of *Macropyxis adunca* analysed by MADDOCKS (1990) (holotype ♂, RV, h: 0.80mm, l: 2.14mm; LV, h: 0.75mm, l: 2.09mm).

The zone of concrescence of the specimens analysed in the present study are slightly wider than the zone of concrescence of specimens figured by MADDOCKS (1990: figs.8.2, 3, 9.2, 3, 19.6). Consequently, vestibules of the former specimens are more constricted than vestibules of the last specimens, but this difference can be age dependent.

Macropyxis adunca is differentiated from *Macropyxis kornickeri* and *Macropyxis similis*, which also occur in the Brazilian waters, by its less elongated and acute posterior angle. Furthermore, *Macropyxis kornickeri* is somewhat larger, with a more sinuous outline, and *Macropyxis similis* has a more straight dorsal margin than *Macropyxis adunca*.

Macropyxis adunca had previously been recorded from the abyssal waters of Angola and Brazil Basins (MADDOCKS, 1990:61-62). In the present, the bathymetric distribution of this species might be extended to the continental slope, and the geographic distribution in the Brazilian waters might be extended northwards.

Macropyxis amanda Maddocks, 1990
(Figs.7-8)

Macrocypris sp.5 – MADDOCKS, 1977:155, fig.10.
Macropyxis amanda Maddocks, 1990:62, figs.8.6, 7, 9.6, 7, 19.1, 22.7, 24.9, 26.26, 27, 30.10, 33.8, 41.5, 46.54, 55, 67.10, 80.4, pls. 12.1-6, 13.1-6, 79.1, 2, 83.1, 88.5-7, 102.1-4, graph 17.

Type-locality – Atlantis II, cruise 42, station 200, 9°41' to 9°43.5'S, 10°55' to 10°57'E, 2644 to 2754m.

Material examined – Eastern Brazilian continental slope. Off Espírito Santo State: 21°12'13"S, 39°52'05"W, 1598-1600m, 3 RLV, 8 RV, 5 LV, MNRJ 18748. Off Rio de Janeiro State: 21°48'22"S, 39°49'55"W, 1092-1438m, 1 RLV, 8 RV, 9 LV, MNRJ 18749; 21°53'11.904"S, 39°50'44.863"W, 1240m, 6 RLV, 19 RV, 14 LV, MNRJ 18750; 21°53'45.759"S, 39°50'22.530"W, 1300m, 1 RLV, 18 RV, 10 LV, MNRJ 18751.

Dimensions – MNRJ 18748 - Gender unknown, RV, h: 0.85mm, l: 2.20mm. Apparent ♀, LV, h: 0.78mm, l: 2.25mm. Gender unknown, LV, h: 0.78mm, l: 2.30mm. MNRJ 18749 - Apparent ♀, RV, h: 0.83mm, l: 2.20mm. MNRJ 18751 5728 - Apparent ♀, RV, h: 0.88mm, l: 2.20mm. Apparent ♀, LV, h: 0.80mm, l: 2.19mm. Apparent ♂, LV, h: 0.75mm, l: 2.19mm. Apparent ♀, LV, h: 0.80mm, l: 2.26mm.

Diagnosis – Carapace fairly large, elongate-oblong in lateral outline with pointed posterior angle; anterior margin slightly obliquely rounded; ventral margin slightly sinuous to nearly straight, slightly upswung posteriorly; dorsal margin broadly arched in a high, sweeping curve, greatest height located anterior to midlength; posterior angle sharp, about 45° to 55°; anterior zone of concrescence fairly wide; radial pore canals complexly and somewhat irregularly branching (MADDOCKS, 1990). In the present study, only carapaces were available for analysis. See MADDOCKS (1990:61) for description and illustrations of appendages.

Supplementary description – Carapace large, with feeble sexual dimorphism, females and males clearly distinguishable by appendages only. Right valve (Figs.7A, B) elongate-oblong, somewhat subtriangular in lateral outline; dorsal margin broadly arched in a high, sweeping curve, greatest height near midlength; anterior margin slightly obliquely rounded. Left valve (Figs.7C, D) with dorsal margin with slightly conspicuous anterodorsal angle; margin segment anterior to this angle fairly straight to slightly concave; margin segment posterior to anterodorsal angle evenly curved, posterodorsal angle indistinct; greatest height anterior to midlength. Right and left valves with ventral margin slightly indented to fairly straight; slightly upswung posterior angle,

about 45° to 55°. Anterior zone of concrescence fairly broad, vestibule constricted to fairly constricted, line of concrescence irregular, radial pore canals complexly and somewhat irregularly branching. Posterior zone of concrescence narrow, vestibule deep, line of concrescence fairly straight; posterior radial pore canals straight. Carapace lozenge-shaped in ventral and dorsal views (Figs.7E, F); with tapering laterals; anterior end rounded; posterior end acutely tapering. Ventral margin sinuous, in ventral view (Fig.7E), with large bow-shaped process. Hinge margin sinuous in dorsal view (Fig.7F), with conspicuous stragulum. Muscle scar pattern (Figs.8A, B) with three dorsal scars and numerous ventral scars.

Distribution – Holocene; South Atlantic, 1092 to 2754m (Figs.2, 13). Angola Basin, 2644 to 2754m, live and dead specimens (MADDOCKS, 1977; 1990). Eastern Brazilian continental slope, 1092 to 1600m, dead specimens (new records).

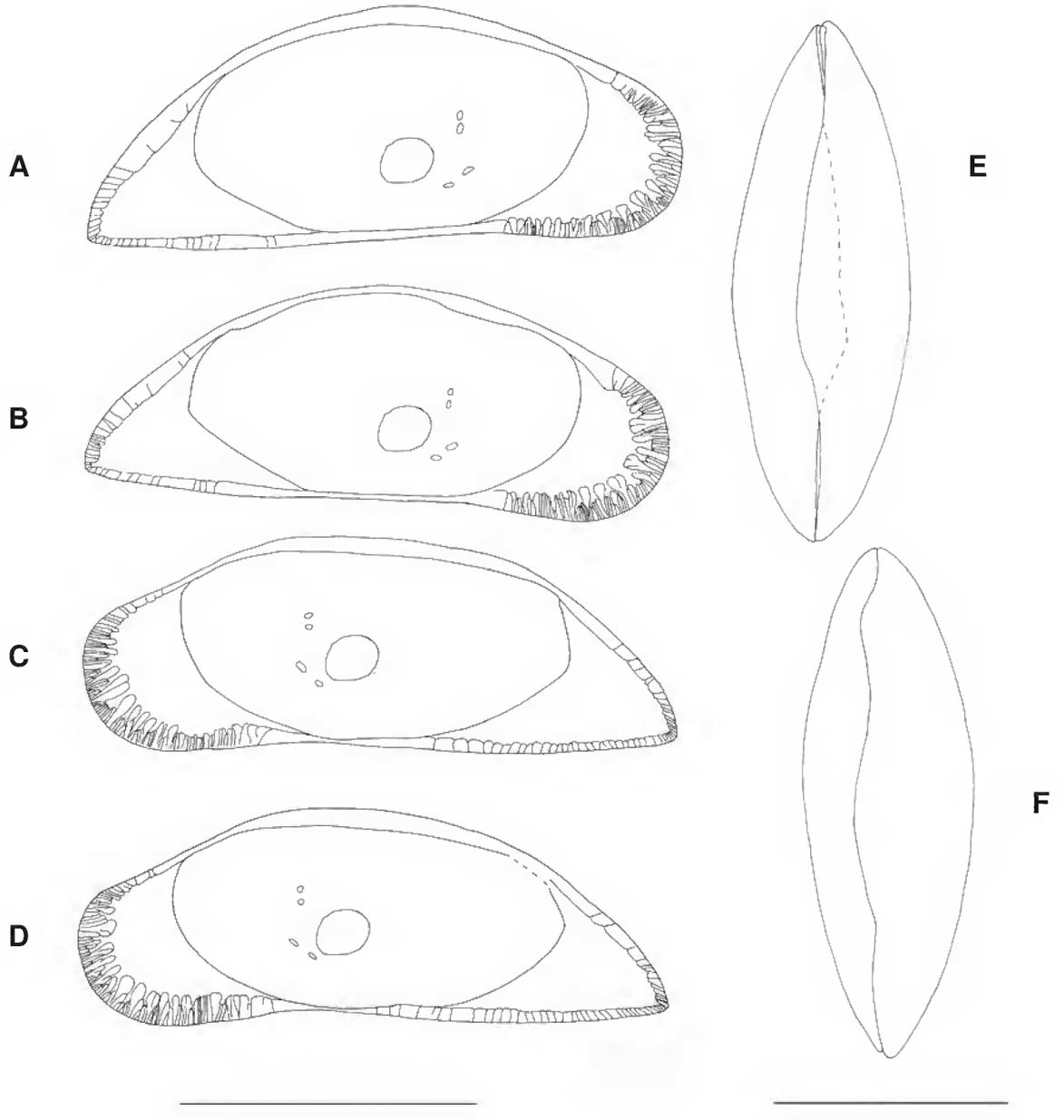

Fig.7- *Macropyxis amanda* Maddocks, 1990, MNRJ 18750: (A) right valve, (B) left valve, (C) right valve, (D) left valve, (E) ventral view of carapace, (F) dorsal view of carapace. Scale bar = 1.0mm.

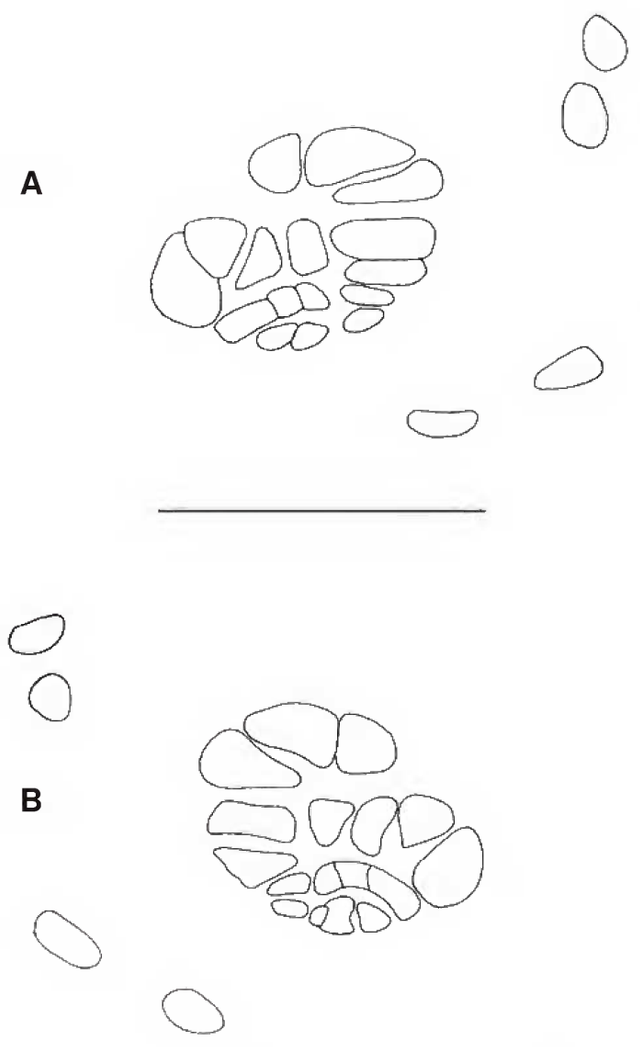

Fig.8- *Macropyxis amanda* Maddocks, 1990, MNRJ 18750: (A) adductor muscle scars of right valve, (B) adductor muscle scars of left valve. Scale bar = 0.2mm.

Remarks – In the synonymy of the description of *Macropyxis amanda*, MADDOCKS (1990:62) included "*Macrocypris* sp.5 MADDOCKS, 1979, fig.10" [*sic*], but she probably wanted to refer to MADDOCKS, 1977. In the study of MADDOCKS (1979) there are two plates, the plate I figure 10 refers to the dentiform corner of a new species tentatively assigned to the genus *Macrocypris*. While the plate II figure 10 shows the female fifth appendage of a new species of *Macrocyprina*. Otherwise, the figure 10 of MADDOCKS (1977) illustrates the external view of right valves of seven species assigned to *Macrocypris*, and one of these species is *Macrocypris* sp.5. Furthermore, the same specimen illustrated in the earlier study (MADDOCKS, 1977, fig.10) was also figured in the description of *Macropyxis amanda* (MADDOCKS, 1990: pls.12.1, 13.1). This specimen appears in both works (MADDOCKS, 1977; 1990) with the same collection number (1457). A list containing MADDOCKS' numbers, the identification, the collecting locality, the repository and some notes of each specimen is given by MADDOCKS (1990: appendix IV).

MADDOCKS (1990:62) stated that the valves of males of *Macropyxis amanda* are slightly shorter and distinctly less high than females, with more elongate outline. Otherwise, through the observation of MADDOCKS' (1990) illustrations (pls.12.1-6, 13.1-6), it is possible to observe that some of the males and females present similar outlines. Therefore, due to the absence of appendages, the gender of the specimens analysed in the present study were not determined, except by some of the measured specimens, which were separated in "apparent females" and "apparent males".

The specimens analysed in the present study have shorter carapaces (approximately 2.1mm) than the African specimens (approximately 2.7mm).

Macropyxis amanda is easily differentiated from other Brazilian species of this genus. *Macropyxis amanda* is larger, with a more subtriangular outline, a more arched dorsal margin, and more numerous radial pore canals than *Macropyxis adrecta* and *Macropyxis adunca*. *Macropyxis kornickeri* has a more inequilateral outline, with a more elongated and more acute posterior angle than *Macropyxis amanda*. Despite the similar size, the valves of *Macropyxis amanda* are easily separated from *Macropyxis similis*, which are lower, with a wider zone of concrescence and more elongate posterior angle.

The geographic range of *Macropyxis amanda*, previously recorded from the Angola Basin, is here extended to the Southwestern Atlantic. Its depth range is also extended to shallower waters, from 2644m to 1092m.

Macropyxis bathyalensis (Hulings, 1967)
(Fig.9)

Macrocypris bathyalensis Hulings, 1967a:638, figs.3f (part), 4r-u; HULINGS, 1967b:314, figs.1 (part), 8a-d, pl.4.

not *Macrocypris bathyalensis* – MADDOCKS, 1977, figs.1, 5, 10; CRONIN, 1983:107, figs.A, C, D, pl.4.

Macrocypris minna – TRESSLER, 1941:98, pl.19, fig.26.

? *Macrocypris* sp. cf. *Macrocypris minna* – WHATLEY & COLES, 1987:1, fig.7.

Macropyxis bathyalensis – MADDOCKS, 1990:66, figs.110.2, 4, 11.2, 4, 18.8, 19.4, 22.2, 10, 24.5, 26.16, 17, 30.7, 12, 33.5, 34.5, 39.5, 46.41-43, 50.24, 51.19, 20, 67.3, 80.7, pls. 12.7-12, 13.7-12, 22.7, 62.1, 63.7-10, 12, 66.5, 79.11-13, 90.5-8, 11, 13, 102.11, 12, 103.4-9, graph 22.

Type-locality – Vema, cruise 17, station 118, 55°50'N, 56°06'W, 3369m.

Material examined – Eastern Brazilian continental slope. Off Espírito Santo: 21°14'31"S, 39°08'00"W, 2302-2426m, 2 RV, 1 LV, MNRJ 18753. Off São Paulo State: 24°06'43"S, 41°52'52"W, 1556-1566m, 1 RLV, 5 RV, 9 LV, MNRJ 18752.

Dimensions – MNRJ 18752 - Gender unknown, RV, h: 0.80mm, l: 1.94mm. Gender unknown, RV, h: 0.70mm, l: 1.94mm. Gender unknown, LV, h: 0.65mm, l: 1.84mm. Gender unknown, LV, h: 0.60mm, l: 1.81mm. Gender unknown, LV, h: 0.58mm, l: 1.90mm.

Diagnosis – Carapace medium-sized to large, elongate-oblong in lateral outline, tapered posteriorly; dorsal margin arching smoothly to greatest height near midlength in females or slightly anterior to midlength in males; anterior margin broadly and fairly evenly rounded; ventral margin nearly straight to slightly sinuate, with weak indentation in mouth region, weakly upswung posteriorly in females, nearly straight in males; posterodorsal margin sloping steeply and continuously to sharp posterior angle of 50° to 60°; anterior zone of concrescence very wide, with complexly branching radial pore canals arranged in elaborate bundles, anterior vestibule correspondingly shallow; posterior zone of concrescence of moderate width, vestibule deep, especially in males (MADDOCKS, 1990). In the present study, only carapaces were available for analysis. See MADDOCKS (1990:64) for description and illustrations of appendages.

Supplementary description – Carapace medium-sized, with sexual dimorphism present but weak, females and males clearly distinguished only by appendages. Right valve (Figs.9A, B) elongate-oblong in lateral outline, tapered posteriorly; dorsal margin arching smoothly to greatest height near midlength in females or slightly anterior to midlength in males; anterior margin broadly and fairly evenly rounded; ventral margin nearly straight to slightly sinuate. Dorsal margin of left valve (Figs.9C, D) with slightly conspicuous to inconspicuous anterodorsal angle, segment anterior anterodorsal angle concave; segment posterior to anterodorsal angle evenly curved, posterodorsal angle fairly indistinct; greatest height anterior near midlength. Left and right valves with weak indentation in mouth region, weakly upswung posteriorly in females, nearly straight in males; posterodorsal margin sloping steeply and continuously to sharp posterior angle of 50° in males and 60° in females. Anterior zone of concrescence wide (Fig.9A), with complexly branching radial pore canals arranged in elaborate bundles (Fig.9B), anterior vestibule correspondingly shallow; posterior zone of concrescence (Fig.9B) of moderate width, vestibule deep, especially in males; line of concrescence irregular. Carapace narrowly elongated in ventral and dorsal views (Figs.9E, F); with tapering laterals. Ventral margin sinuous, in ventral view (Fig.9E), with large bow-shaped process. Hinge margin sinuous in dorsal view (Fig.9F).

Distribution – Quaternary; Atlantic Ocean, 1092 to 3834m (Figs.3, 13). Continental slope off southeastern USA, 201 to 667m, dead specimens (HULINGS, 1967a). North American Basin, 1135 to 3834m, live and dead specimens (MADDOCKS, 1990). Labrador Basin, 2137 to 3521m, live and dead specimens (HULINGS, 1967a, 1967b; MADDOCKS, 1990). European Basin, 1955 to 3230m, dead specimens (TRESSLER, 1941; MADDOCKS, 1990). Eastern Brazilian continental slope, 1556 to 2426m, dead specimens (new record).

Remarks – *Macropyxis bathyalensis* is distinguished from most other Atlantic species of this genus by its nearly straight ventral margin and tapering posterior end (MADDOCKS, 1990). Among the Brazilian species, *Macropyxis adrecta* and *Macropyxis adunca* are smaller, with more sinuous outlines, and less arched dorsal margin than *Macropyxis bathyalensis*. *Macropyxis amanda* is slightly larger, proportionately more elongate, with a less arched dorsal margin and more elaborately branching radial pore canals when compared to *Macropyxis bathyalensis*, and also presents different sexual dimorphism (MADDOCKS, 1990). Compared with *Macropyxis kornickeri*, *Macropyxis bathyalensis* is similar in shape but higher in proportion to length, with less prolonged posterior angle; and greatest height located near middle length, while in *Macropyxis kornickeri* greatest height is anterior to middle length.

The geographic range of *Macropyxis bathyalensis*, previously recorded to North Atlantic, is here extended to the Southwestern Atlantic.

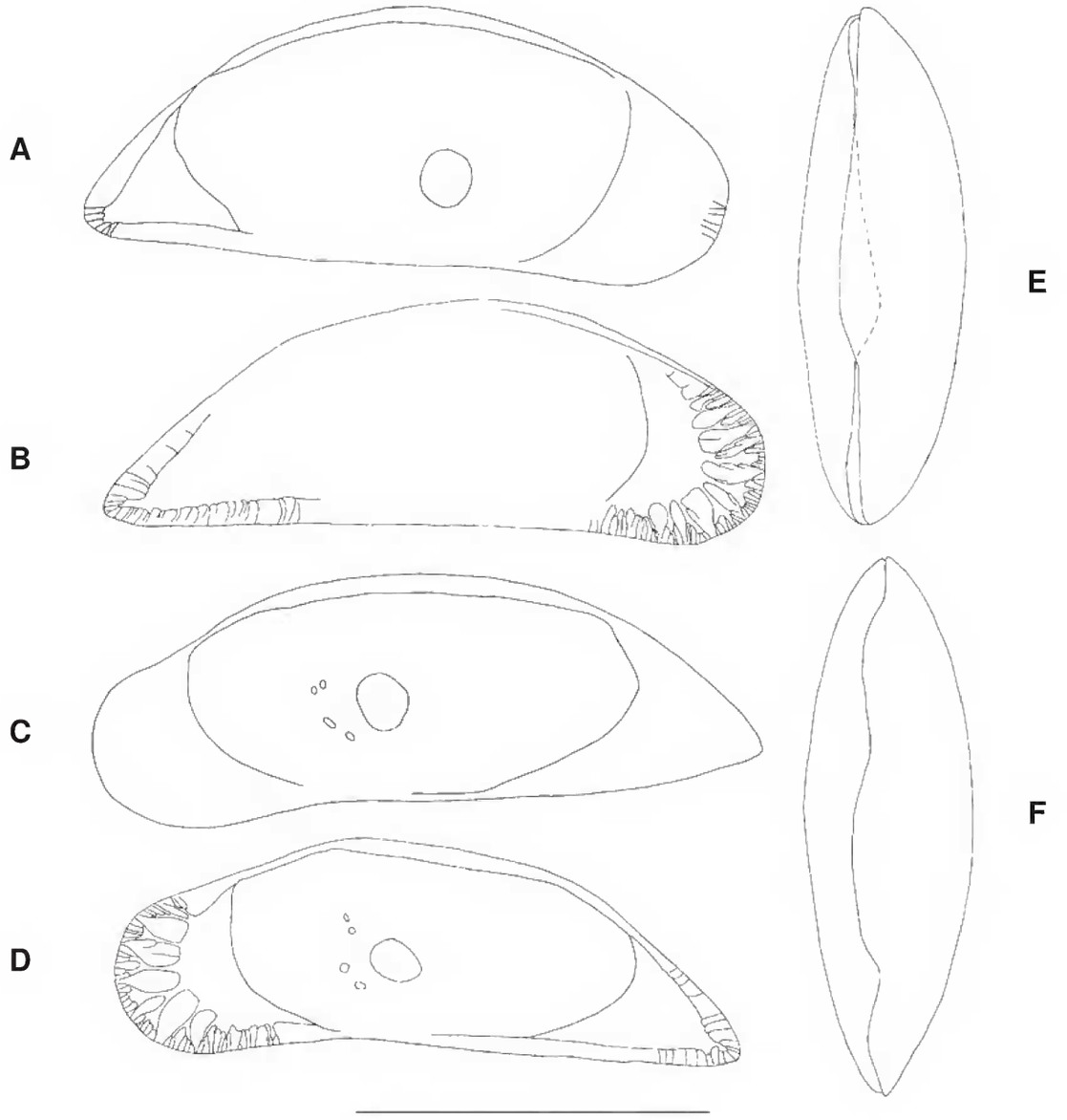

Fig.9- *Macropyxis bathyalensis* (Hulings, 1967), MNRJ 18752 (A, C, E, F), MNRJ 18753 (B, D): (A) right valve of probable female, (B) left valve of probable female, (C) right valve of probable male, (D) left valve of probable male, (E) ventral view of carapace, (F) dorsal view of carapace. Scale bar = 1.0mm.

Macropyxis similis (Brady, 1880)
(Figs.10-11)

Macrocypris similis Brady, 1880:42, figs.2a-d; MÜLLER, 1912:122; PURI & HULINGS, 1976:260, pl.1, figs.13,14.

not *Macrocypris similis* – SCOTT, 1903:370; CHAPMAN, 1919:20; figs.2a-d, pl.2; TRESSLER, 1954:433; MADDOCKS, 1977, figs.3, 6, 7; HANAI, IKEYA & YAHIMA, 1980:121.

not *Macrocypris* sp. aff. *similis* – HERRIG, 1977:1156.

not *Macrocypris* sp. cf. *Macrocypris similis* – NEALE, 1967:7, figs.s, s', t, pl.1.

not *Macrocyprina similis* – BHATIA, GUHA & MCKENZIE, 1972:37.

Macropyxis similis – MADDOCKS, 1990:73, figs.10.6, 7, 11.5, 6, 18.6, 22.13, 26.28, 29, 30.5, 34.16, 38.4, 46.49, 50, 67.6, 80.6, pls. 24.2, 3, 11, 12, 25.2, 3, 79.26, 27, 90.9, 10, 14, 103.10-12, graph 29.

Type-locality – H.M.S.Challenger, station 120, 8°37'S, 34°28W, 675 fathoms (1234m), off Pernambuco, Brazil, trawled, red mud, surface temperature 78° F, September 9, 1873.

Material examined – Eastern Brazilian continental slope. Off Espírito Santo State: 21°12'13"S, 39°52'05"W, 1598-1600m, 4 RLV, 6 RV, 8 LV, MNRJ 18754. Off Rio de Janeiro State: 21°48'22"S, 39°49'55"W, 1092-1438m, 12 RV, 10 LV, MNRJ 18755 5732; 21°53'11.904"S, 39°50'44.863"W, 1240m, 2 RLV, 22 RV, 17 LV, MNRJ 18756; 21°53'45.759"S, 9°50'22.530"W, 1300m, 3 RLV, 16 RV, 10 LV, MNRJ 18757.

Dimensions – MNRJ 18754 – Apparent ♂ – RV, h: 0.79mm, l: 2,23mm. Apparent ♀ - RV, h: 0.78mm, l: 2.20mm. Apparent ♂ - LV, h: 0.68mm, l: 2.16mm. Apparent ♀ - LV, h: 0.73mm, l: 2.16mm. MNRJ 158755 - Gender unknown - RV, h: 0.75mm, l: 2.18mm. Gender unknown - LV, h: 0.65mm, l: 2.15mm. MNRJ 18756 - Gender unknown - RV, h: 0.73mm, l: 2.20mm. Gender unknown - RV, h: 0.75mm, l: 2.23mm. Gender unknown - LV, h: 0.68mm, l: 2.20mm. Gender unknown - LV, h: 0.68mm, l: 2.18mm.

Diagnosis – Carapace elongate-siliquose in lateral outline with sinuous contours; dorsal margin low arched, somewhat irregular, with greatest height located at midlength; anterior margin broadly and evenly rounded; ventral indentation shallow but distinct; posteroventral margin nearly straight in female, slightly upturned in male; prolonged, truncate posterior angle of about 30° to 40°, located a little above the venter, flared in male; anterior zone of concrescence very broad, vestibules correspondingly small, anterior radial pore canals elaborately branching (MADDOCKS, 1990). In the present study, only carapaces were available for analysis. See MADDOCKS (1990:73) for description and illustrations of appendages.

Supplementary description – Carapace fairly large to large, with sexual dimorphism present but weak (Figs.10A-D). Female right valve (Fig.10A) elongate-oblong, with sinuous contours; dorsal margin fairly high-arched. Male right valve (Fig.10B) elongate, with sinuous contours; dorsal margin low-arched. Female and male right valves with greatest height located near midlength; anterior margin broad and evenly rounded. Left valve very elongated (Figs.10C, D), dorsal margin with anterodorsal angle slightly conspicuous in female and inconspicuous in male; anterodorsal margin slightly concave; remaining dorsal margin evenly curved, posterodorsal angle indistinct; greatest height located near midlength. Right valve with ventral margin slightly indented; left valve with ventral margin with conspicuous indentation; both valves with slightly upswung posterior angle, about 30° to 40°. Anterior zone of concrescence broad, vestibule constricted, line of concrescence irregular, anterior radial pore canals complexly and irregularly branching. Posterior zone of concrescence narrow, vestibule deep, line of concrescence fairly straight; most of posterior radial pore canals straight, few slightly branching. Carapace elongate-ovate in ventral and dorsal views (Figs.10E, F); with tapering laterals; anterior end rounded; posterior end acutely tapering. Ventral margin sinuous, in ventral view (Fig.10E), with large bow-shaped process. Hinge margin sinuous in dorsal view (Fig.10F), with conspicuous stragulum. Muscle scar pattern (Figs.11A, B) with two dorsal scars and numerous ventral scars.

Distribution – Holocene; Southwestern Atlantic, 587 to 1600m (Figs.1, 13). Eastern Brazilian continental slope, 587 to 1600m, live and dead specimens (BRADY, 1880; MADDOCKS, 1990; present study).

Remarks – MADDOCKS (1990:74) stated that the valves of males of *Macropyxis similis* are as long as the valves of females but not as high. Because of the uncertainty in determining the gender of specimens based solely in caparace outline, and once the appendages were not available, the gender of the specimens analysed in the present study were not determined.

The supposition of MADDOCKS (1990:74) that "size appears to decrease with depth" might be confirmed in the present study, as specimens from southeastern Brazilian waters are shorter (1600m, approximately 2.1mm) than specimens collected in northeastern waters (1234m, approximately 2.3mm; 587m, approximately 2.5mm).

Macropyxis amanda and *Macropyxis similis* occurred in the same samples of eastern Brazilian continental slope, both species being the largest Brazilian Macrocyprididae.

The geographic range of *Macropyxis similis* is here extended southwards, and its bathymetric range is also extended to slightly deeper waters (from 1234m to 1600m).

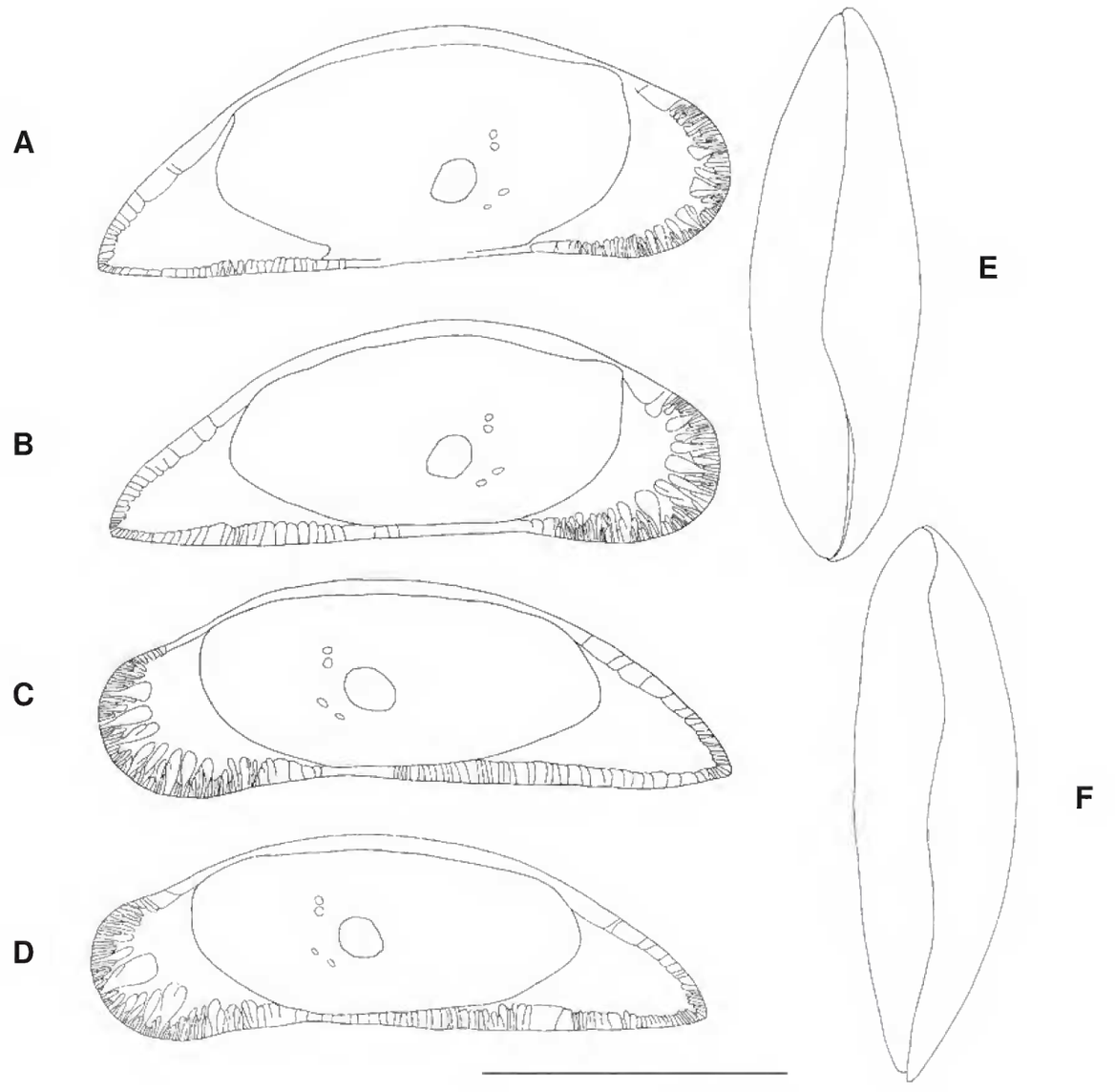

Fig.10- *Macropyxis similis* (Brady, 1880), MNRJ 18756 (A-D), MNRJ 18754 (E-F): (A) right valve of probable female, (B) left valve of probable female, (C) right valve of probable male, (D) left valve of probable male, (E) ventral view of carapace, (F) dorsal view of carapace. Scale bar = 1.0mm.

Genus *Macrosarisa* Maddocks, 1990

Type species – *Macrosarisa bensoni* Maddocks, 1990.

Additional species – *Macrosarisa capacis* Maddocks, 1990; *M. elegantula* (Whatley & Downing, 1983); *M. exquisita* (Kaye, 1964); *M. graysonensis* (Alexander, 1929); *M. hiulca* Maddocks, 1990; *M. muensteriana* (Jones & Hinde, 1890); *M. siliqua* (Jones, 1849); *M. simplex* (Chapman, 1898); *M. texana* Maddocks, 1990; *M. wrightii* (Jones & Hinde, 1890).

Remarks – The genus *Macrosarisa*, with 11 described species, occurs in the Atlantic and southwestern Indic, with a live depth range from 40 to 3783m, and with a geologic range from the Lower Cretaceous (Albian) to Recent. The length of adult carapace of species of *Macrosarisa* varies from 0.8mm in *Macrosarisa graysonensis* to 2.5mm in *Macrosarisa wrightii*.

Only one species of *Macrosarisa* was this far recorded from Brazil. MADDOCKS (1990:94) reported *Macrosarisa* sp.23, which is the same species as the one described below.

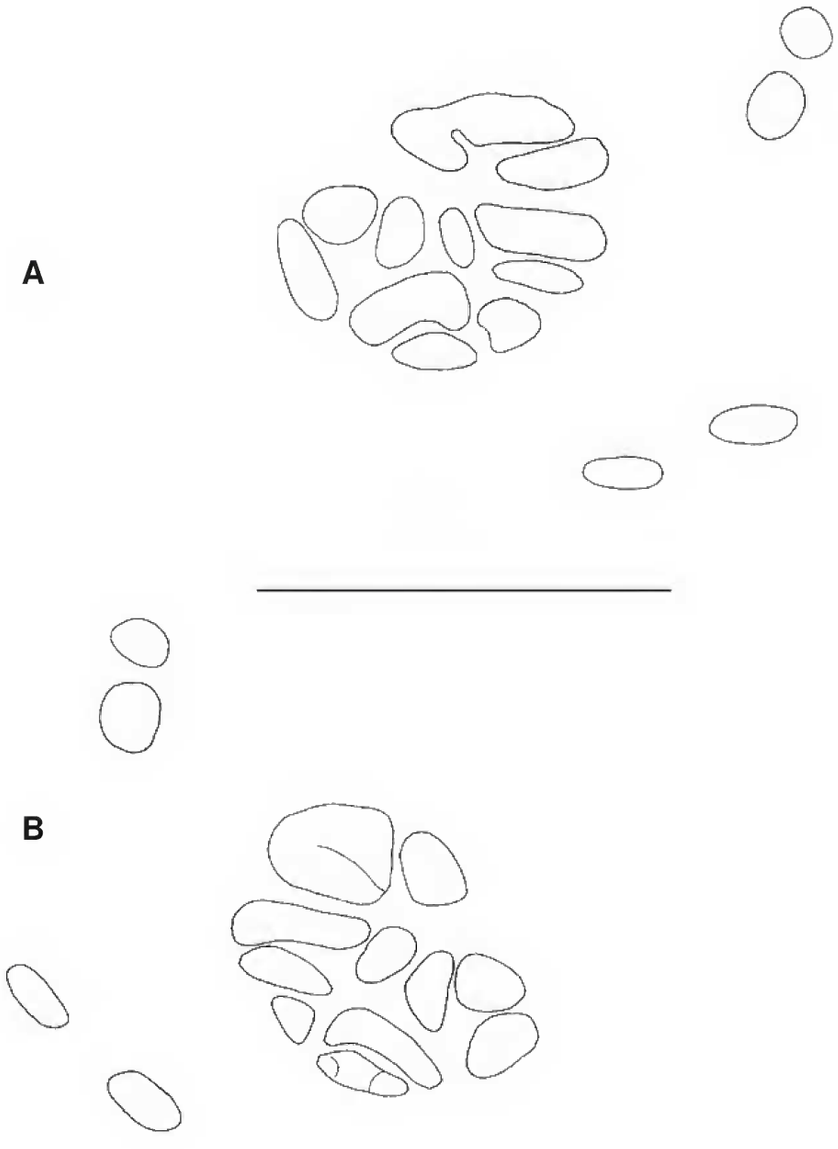

Fig.11- *Macropyxis similis* (Brady, 1880), MNRJ 18756: (A) adductor muscle scars of right valve, (B) adductor muscle scars of left valve. Scale bar = 0.2mm.

Macrosarisa sp.1
(Fig.12A)

Macrosarisa sp.23 – MADDOCKS, 1990:94, figs.12.16, 28.44, 45, 35.18, 44.1, 47.9, 68.3, 80.21, pls.28.1-3, 29.1-3, 74.2, 4, 83.12, 84.1, 91.7, 8, 104.8, 9, graph 53.

Material examined – Eastern Brazilian continental slope. Off Rio de Janeiro: 21°14'31"S, 39°08'00"W, 2302-2426m, 1 LV, MNRJ 18758.

Dimensions – Gender unknown – LV, h: 0.49mm, l: 1.54mm.

Description – Carapace thin, medium-sized, left valve (Fig.12A) elongate in lateral outline; dorsal margin unevenly arched; greatest height located near midlength; anterior margin narrowly truncate; anteroventral dentiform corner conspicuous; ventral margin nearly straight, slightly upswung posteriorly; posteroventral angle truncate, of about 45°; anterior and posterior zone of concrescence very narrow, with straight radial pore canals; anterior and posterior vestibules deep.

Distribution – Holocene; Southwestern Atlantic, 2302 to 3783m (Figs.1, 13). Brazil Basin, 3730 to 3783, live specimen (MADDOCKS, 1990). Eastern Brazilian continental slope, 2302 to 2426m, dead specimen (new record).

Remarks – The outline of the specimen analysed in the present study (*Macrosarisa* sp.1) is very similar to the outline of specimen of *Macrosarisa* sp.23 of MADDOCKS (1990:94, fig.12.16, pls.28.1-3, 29.2, 3), what indicates that they are a single species.

The specimen analysed by MADDOCKS (1990) is larger (1.94mm) than specimen analysed in the present study (1.54mm). This difference could indicate a size variation related to depth or geographic locality. Otherwise, the smallest specimen could also be a juvenile; with the largest specimen being an adult (MADDOCKS, 1990). The posterior region of the valves, which can be shortened in juveniles (MADDOCKS, 1990), is similar in both specimens. The calcified inner lamella and zone of concrescence, which are narrower in juveniles, were not figured by MADDOCKS (1990). And, finally, the absence of the appendages in the specimen analysed herein makes it impossible to know its age.

This is the only species of *Macrosarisa* this far recorded from Brazil, being conspicuously distinct from other species of the genus, with "the more elongate and the less angulate, sinuous outline than any other living species" of *Macrosarisa*, as stated by MADDOCKS (1990:94). Its outline resembles the outline of the Cretaceous (Cenomanian) species *Macrosarisa graysonensis* (Alexander, 1929), but some differences are observed: *Macrosarisa graysonensis* has the carapace higher in proportion to length; and has a more sinuous ventral margin, with anterior and posterior angles projected ventrally, while ventral margin of *Macrosarisa* sp.1 is nearly straight. Furthermore, appendages of this unnamed species also present distinctive features when compared to other species of *Macrosarisa*: hemipenis outline; vas deferens very thick and stiff, not coiled or looped, shaped like an elongate question mark, and more than twice as long as the muscularized part of the Zenker's organ (MADDOCKS, 1990:74, pls.91.7, 8, 104.8, 9). Therefore, this unnamed species probably constitute a new taxon. It will not be named in the present study due to the insufficient material available.

Macrosarisa sp.23 was recorded by MADDOCKS (1990) for the equatorial Atlantic, Brazil Basin, from 3730 to 3783m. In the present study, the geographic range of this species is extended southwards, and its bathymetric range is extended to the continental slope (2302m).

Genus *Macroscapha* Maddocks, 1990

Type species – *Macroscapha atlantica* Maddocks, 1990.

Additional species – *Macroscapha gyreae* Maddocks, 1990; *M. heroica* Maddocks, 1990; *M. inaequalis* (Müller, 1908); *M. inaequata* Maddocks, 1990; *M. jiangi* Maddocks, 1990; *M. marchilensis* (Hartmann, 1961); *M. opaca* Maddocks, 1990; *M. sinuata* Maddocks, 1990; *M. tensa* (Müller, 1908); *M. turbida* (Müller, 1908).

Remarks – The genus *Macroscapha*, with 11 described species, occurs worldwide, with a live depth range from 16 to 3694m, but recorded dead up to 9m, and known only from the Holocene. The genus *Macroscapha* is widely distributed in sublittoral and bathyal depths, being best represented in the Antarctic and southern regions of Southern Hemisphere. The length of adult carapace of species of *Macroscapha* varies from 1.3mm in *Macroscapha gyreae* to 2.5mm in *Macroscapha tensa*.

There was only one record of *Macroscapha* from Brazil. MADDOCKS (1990:108) recorded one unnamed specimen as *Macroscapha* sp.30.

Macroscapha aff. inaequata Maddocks, 1990
(Figs.12B-D)

Type-locality – Eltanin, cruise 6, station 350, 55°03' - 55°00'S, 58°57' - 58°51'W, 2452m.

Material examined – Eastern Brazilian continental slope. Off Rio de Janeiro State: 21°53'11.904" S, 39°50'44.863"W, 1240m, 1 RV, 1 LV, MNRJ 18760. Off São Paulo State: 24°06'43"S, 41°52'52"W, 1556-1566m, 1 RV, MNRJ 18759.

Dimensions – MNRJ 18760 – RV, h: 0.64mm, l: 1.60mm. LV, h: 0.61mm, l: 1.55mm.

Description – Carapace fairly small, elongate-subtriangular to oblong in lateral outline (Figs.12B, C); posterodorsal margin of right valve sloping more acutely than anterodorsal margin; dorsal margin with indistinct dorsal angle; greatest height at midlength; anterior margin evenly rounded, without distinct angles; ventral indentation conspicuous, remainder of ventral

margin nearly straight, posterior end slightly upswung; posterior angle very broadly rounded, about 40°, located at or slightly above the venter; zone of concrescence fairly broad, especially in posterodorsal and anteroventral portions; most of radial pore canals straight, few slightly branching. Muscle scar pattern (Figs.12D) with three dorsal scars and numerous ventral scars arranged in three groups.

Distribution – Holocene; Southwestern Atlantic (Figs.1, 13). Eastern Brazilian continental slope, 1240 to 1566m, dead specimens (new record).

Remarks – The specimens analysed here are considered *Macroscapha* aff. *inaequata* because, despite their a great similarity to *Macroscapha inaequata*, some differences could be observed between them and the typical representatives of the latter species. The specimens of *Macroscapha* aff. *inaequata* present evenly rounded anterior margin, while specimens of *Macroscapha inaequata* present angulate anterior margin – MADDOCKS, 1990: fig.14 (15-16); *Macroscapha* aff. *inaequata* has an unevenly sloping dorsal margin, while in *Macroscapha inaequata* the dorsal margin slopes evenly to anterior and posterior ends. Furthermore, *Macroscapha* aff. *inaequata* is slightly smaller (1.5-1.6mm) than specimens analysed by MADDOCKS (1990: graph 47) (1.8-2.2mm). In this way, the specimens analysed in the present study can represent a new species, but more material with soft parts is necessary to solve this question. Only 2 right and 1 left valves were examined, and the lack of appendages prevents a better description.

There was only one previous record of *Macroscapha* from Brazil, *Macroscapha* sp.30 (MADDOCKS, 1990:108) collected from the eastern Brazilian continental slope (834-839m). The juvenile female (last instar) figured by MADDOCKS (1990: figs.52.41, 53.40, 64.19) is smaller (length 1.17mm), but similar to specimens analysed in the present study. In this way, the specimens analysed in the present study and that analysed by MADDOCKS (1990) may be included in a single species.

Macroscapha inaequata was previously recorded in 7 samples from the Antarctica and southeastern tip of South America (MADDOCKS, 1990), from 55° to 75°S. If the specimens analysed in the present study are considered *Macroscapha inaequata*, the geographic range of this species should be extended northwards.

Macroscapha sp.1
(Fig.12E)

Material examined – continental slope off Rio de Janeiro State, Brazil. 21°53'45.759"S, 39°50'22.530"W, 1300m, 1 juvenile damaged RV, MNRJ 18761.

Dimension – MNRJ 18761 - RV, h: 0.70mm, l: 1.78mm.

Description – Carapace medium-sized, oblong-elongate (Fig.12E) in lateral outline; dorsal margin low arched; greatest height slightly anterior to midlength; anterior margin evenly, broadly rounded; ventral margin nearly straight; anterior and posterior zone of concrescence very narrow, with straight radial pore canals; anterior and posterior vestibules shallow.

Distribution – Holocene; Southwestern Atlantic (Figs.1, 13). Eastern Brazilian continental slope, 1300m, dead specimen (new record).

Remarks – The unnamed female juvenile (*Macroscapha* sp.30) recorded from northeastern Brazilian continental slope by MADDOCKS (1990:108, figs.52.41, 53.40, 64.19), is considerably smaller (length 1.17mm), with a wider vestibule, more sinuous ventral margin, and more arched dorsal margin, than specimen examined herein. Therefore, these two specimens are considered different species.

Although the specimen analysed in the present study (*Macroscapha* sp.1, Fig.12E) resembles adults of *Macroscapha marchilensis* (Hartmann, 1965) or juveniles of *Macroscapha atlantica* Maddocks, 1990, *Macroscapha inaequata* Maddocks, 1990, *Macroscapha opaca* Maddocks, 1990, and *Macroscapha sinuata* Maddocks, 1990 (MADDOCKS, 1990: figs.52.19-21, 29, 30, 53.13, 24, 25, 26), some differences could be noted. These five species have a more arched dorsal margin, and a more sinuate ventral margin than *Macroscapha* sp.1. Furthermore, *Macroscapha atlantica* and *Macroscapha sinuata* have posterodorsal concavity, while in *Macroscapha* sp.1 the posterodorsal margin is straight; and *Macroscapha opaca* and *Macroscapha sinuata* have a more truncate anterior margin, while in *Macroscapha* sp.1 the anterior margin is broadly rounded. Therefore, *Macroscapha* sp.1 might be a new species, but more material is necessary for analysis.

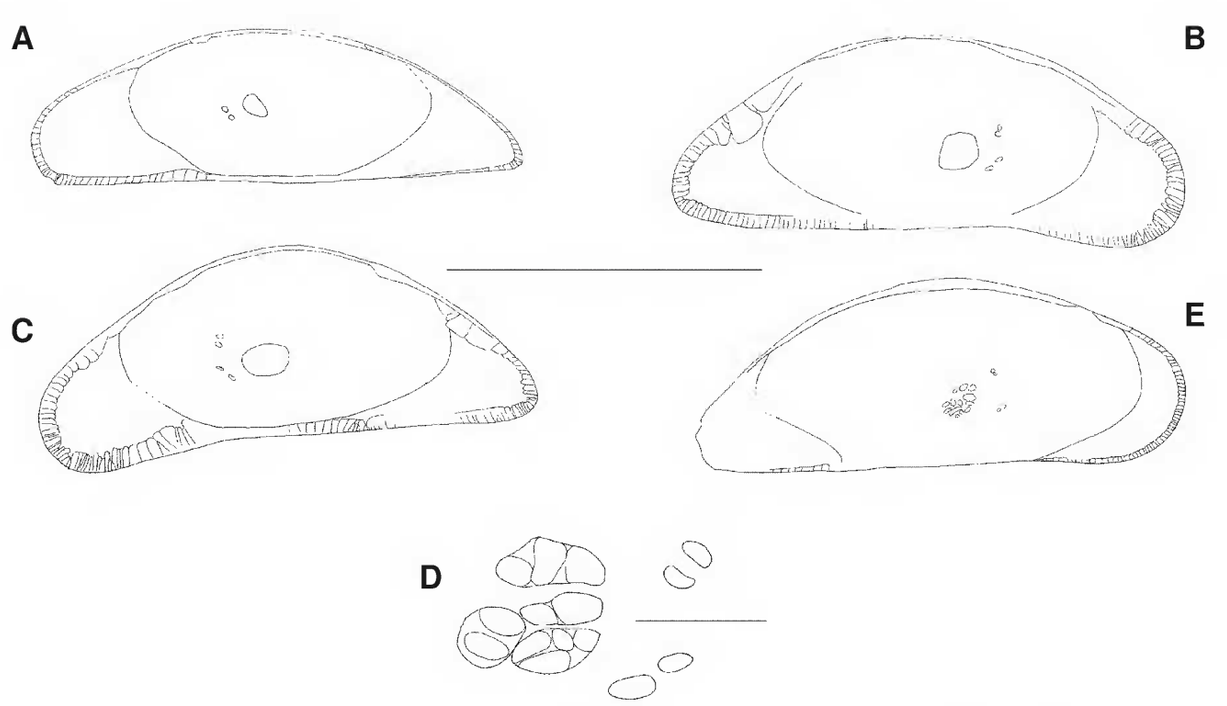

Fig.12- *Macrosarisa* sp.1, MNRJ 18758: (A) left valve; *Macroscapha aff. inaequata* Maddocks, 1990, MNRJ 15737: (B) right valve, (C) left valve, (D) adductor muscle scars of right valve; *Macroscapha* sp.1, MNRJ 15738: (E) right valve. Scale bars (A-C, E) = 1.0mm, (D) = 0.1mm.

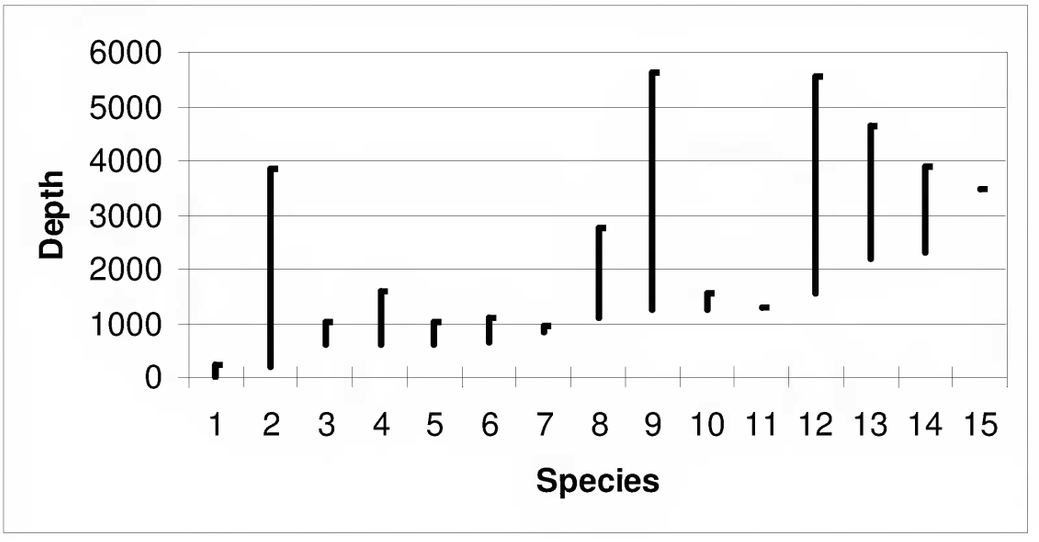

Fig.13- Bathymetric distribution of the macrocypridid species reported from the deep-sea off Brazil: (1) *Macrocyprina* sp.1 of COIMBRA (1995) and COIMBRA *et al.* (1999), (2) *Macropyxis bathyalensis*, (3) *Macropyxis kornickeri*, (4) *Macropyxis similis*, (5) *Macroscapha* sp.2, (6) *Macrosarisa bensoni*, (7) *Macropyxis* sp.1 of MADDOCKS (1990), (8) *Macropyxis amanda*, (9) *Macropyxis adrecta*, (10) *Macroscapha aff. inaequata*, (11) *Macroscapha* sp.1, (12) *Macropyxis adunca*, (13) *Macrocypris maioris*, (14) *Macrosarisa* sp.1, (15) *Macropyxis* sp.2 of MADDOCKS (1990).

DISCUSSION

Eight species were observed in the six samples analysed: *Macropyxis adrecta*, *Macropyxis aduncа*, *Macropyxis amanda*, *Macropyxis bathyalensis*, *Macropyxis similis*, *Macrosarisa* sp.1, *Macroscapha* aff. *inaequata* and *Macroscapha* sp.1. *Macropyxis adrecta* and *Macropyxis amanda*, previously collected in the Eastern Atlantic, are recorded for the first time from the Western Atlantic. Macropyxis *bathyalensis*, previously recorded from the North Atlantic, is recorded for the first time from the South Atlantic. *Macropyxis similis* has its geographic range extended southwards.

After the present study, a total of nine named species and six unnamed species of Macrocyprididae have been recorded from Brazilian deep-sea. The known distribution of these species is rather punctual due to the low number of samples analysed (Figs.1-3). Additional sampling over Brazilian continental slope and abyssal plain will probably increase the number of species recorded from these regions.

All 15 species of deep-sea Macrocyprididae recorded from Brazil are endemic to the Atlantic Ocean. Four of them, *Macropyxis kornickeri*, *Macropyxis similis*, *Macrocyprina* sp.1, *Macrosarisa* sp.1, have been recorded exclusively from Brazilian waters, being endemic to Brazil Basin and the adjacent continental slope (Fig.1). *Macropyxis adrecta*, *Macropyxis aduncа*, *Macropyxis amanda*, and *Macrocypris maioris* occur in the South Atlantic (Fig.2), these four species occur in the Brazil Basin and adjacent continental slope, and in the Angola Basin; and *Macrocypris maioris* occurs also in the Sierra Leone Basin. *Macropyxis bathyalensis* and *Macrosarisa bensoni* occur in the South and North Atlantic (Fig.3). *Macropyxis bathyalensis* occurs on the eastern Brazilian continental slope, in the North American, Labrador, and European Basins. *Macrosarisa bensoni* occurs on the continental slopes off northeastern Brazil and southeastern USA. The remaining five species, *Macropyxis* sp.1, *Macropyxis* sp.2, *Macroscapha* aff. *inaequata*, *Macroscapha* sp.1 and *Macroscapha* sp.2, which were left in open nomenclature, have doubtful geographic distribution (Fig.1). The records of the species previously recorded from off Brazil are listed in table 1.

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